

First report of the genus *Heleanna* Clarke (Lepidoptera, Tortricidae, Olethreutinae) from the Palearctic region, with descriptions of two new species from Japan and Korea

Yoshitsugu NASU¹ and Bong-Kyu BYUN²

¹⁾ 153-2, Nakado, Hashimoto, Wakayama, 648-0023 Japan

²⁾ Korea National Arboretum, Soheul-Eup, Pochen, Prov. Gyeonggi, 487-821 Korea

Abstract We describe two new species of the genus *Heleanna* Clarke, *H. turpinivora*, sp. nov. and *H. tokyoensis*, sp. nov. from Japan and Korea, with illustrations of adults and genitalia. Biology and morphology of the immature stages of *H. turpinivora* feeding on *Turpinia ternata* Nakai (Staphyleaceae) are described. The genus has previously been reported from the Oriental and Australian regions. In this study, we record this genus for the first time from the Palearctic region, based on materials from Honshu, Japan and Jeju-do Island, Korea. Morphology of immature stages of the genus is discussed.

Key words Eucsomini, *Heleanna turpinivora*, sp. nov., *Heleanna tokyoensis*, sp. nov., larva, pupa, fauna.

Introduction

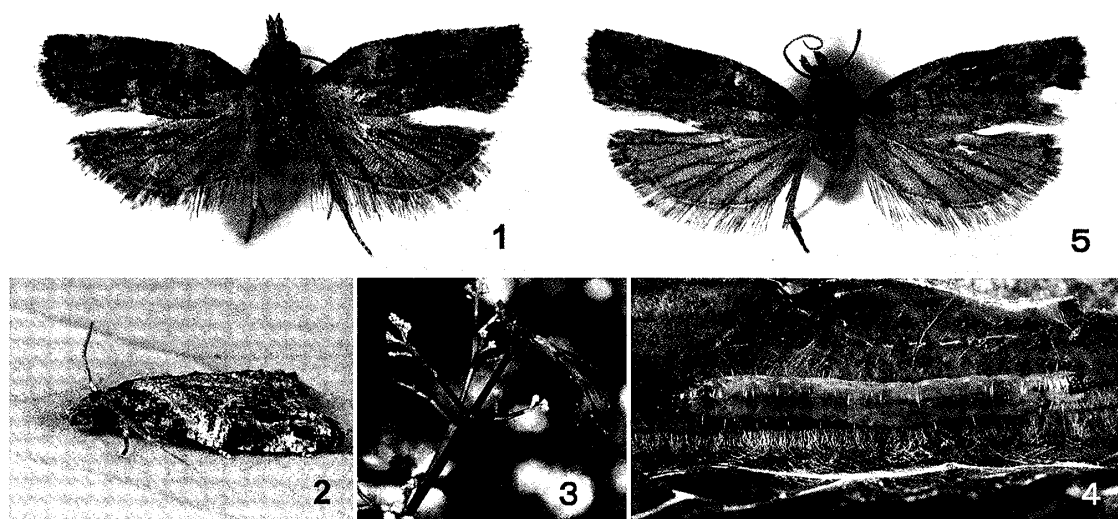
The genus *Heleanna* Clarke, 1976 is a small genus of the tribe Eucsomini distributed in the Oriental and Australian regions, containing four described and one undescribed species (Clarke, 1976; Horak *et al.*, 1996; Nasu, 1995, 1999; Brown, 2005; Horak, 2006). Because the members of the genus are externally very similar to each other in appearance, the most useful characters for recognizing species are the genitalic features of both sexes. Horak (2006) listed several characters on the adults supporting the monophyly of the genus, *e. g.* face flattened, an ovate depression on the basal area of the upperside forewing filled with whitish, modified scales and covered with large, domed scales, and stalked R₄ and R₅ in the forewing. Until now, only one species, *H. fukugi* Nasu, 1999 has been recorded from the Ryukyus in Japan (Nasu, 1999), and no species from Korea.

During examination of material from Japan and Korea, we found two new species of the genus. We herein describe the two new species, with illustrations of adults, genitalia and immature stages, and discuss the morphological characters of the immature stages of the genus.

Materials and methods

The present study is based on specimens feeding on *Turpinia ternata* Nakai collected from Okinawa and on a moth collected in the Garden of the Imperial Palace, Tokyo, Japan, and a specimen from Jeju-do Island, Korea. The following acronyms are used for the depositories of specimens: KNA—Korea National Arboretum, Pochen, Korea; NSMT—National Science Museum, Tokyo, Japan; UOP—Entomological Laboratory of Osaka Prefecture University, Sakai, Japan; YNC—Collection of Y. Nasu.

Male and female genitalia were dissected after being macerated for about 5 min, in 10% KOH heated in a water bath, and stained with Chlorazol Black E. Larvae and pupae were usually fixed in KAAD fluid and stored in 95% ethanol. Larvae were slit lengthwise later-



Figs 1–5. Adults and larva of *Heleanna* spp. 1–4. *H. turpinivora* sp. nov. 1. Holotype, ♂. 2. Resting adult. 3. Damaged host plant by larva. 4. Mature larva. 5. *H. tokyoensis* sp. nov., holotype, ♂.

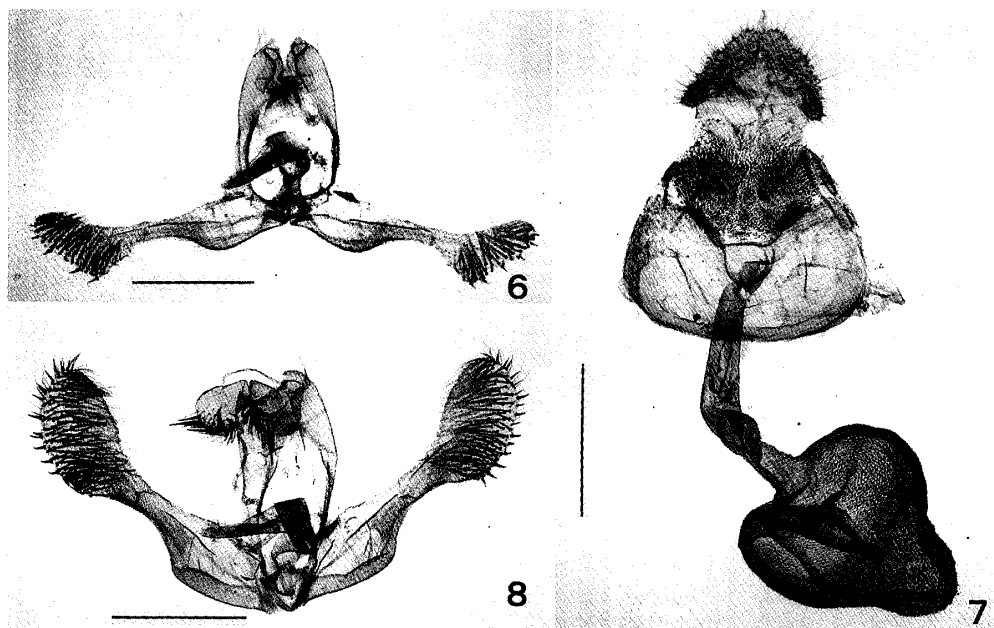
ally and macerated for about 5 min, in 10% KOH heated in a water bath, and after washing and staining with acetocarmine for examining the larval morphology, *e. g.* chaetotaxy and anal forks. Images of adults were obtained using a digital camera, Nikon Coolpix 995, and those of genitalia and larval skins using a digital camera, Nikon Coolpix 8400, attached to a microscope, Nikon Eclipse E200. Illustrations of chaetotaxy of larval head and pupa were drawn using a drawing apparatus attached to a binocular microscope, Leica MZ16. Digital images of adults, genitalia and larva were enhanced using Microsoft Photo Editor and Adobe Photoshop software.

Descriptions

Heleanna turpinivora Nasu and Byun, sp. nov. (Figs 1–4, 6, 7, 9–17)

Diagnosis. The species has a brownish yellow forewing with a large dark brown semicircular patch on the middle of the costa and two dark brown irregular patches on apical 1/3 of the wing. The male genitalia are characterized by a wide dorsal concavity on the tegumen, a slender valva and triangular cucullus. The female genitalia are characterized by large, flat papillae anales and a spinulose eighth sternite. The moth is superficially similar to the next species, *H. tokyoensis* sp. nov., but it can be distinguished from the latter in having a brown-er forewing ground color, a larger dark brown patch (instead of slender ones) at apical 1/3 of the wing and a small and triangular cucullus (instead of a large, oval one).

Adult. Male (Fig. 1). Wing expanse 9–11 mm. Head brownish gray, tips of scales whitish; face flattened, with scales extending over it. Antenna simple, thick, grayish brown. Labial palpus short, grayish brown, inner side whitish; second segment triangular. Thorax and tegula dark gray, tips of scales whitish brown. Forewing elongate oblong, costa concave at basal 1/5, apex and tornus round, upperside with three or four scale-tufts on the basal 1/3. Upperside ground color brownish yellow, overlaid with gray. Costa dark brown scattered with brown at basal 1/5, with a large, dark brown, semicircular patch scattered with brown on the middle and three dark brown dots on apical 1/3. Two irregular dark brown patches on apical 1/3 of the wing, one at the apical end of discal cell and the other before apex.



Figs 6–8. Genitalia of *Heleanna* spp. 6, 7. *H. turpinivora* sp. nov. 6. ♂, holotype, genitalia slide no. YN988. 7. ♀. 8. *H. tokyoensi* sp. nov., ♂, holotype, genitalia slide no. NSMT2703. Scale lines: 0.5 mm.

Two or three small gray patches along termen. Cilia dark brown, yellowish on tornus. Underside grayish brown, costa dark brown at basal 1/5, lighter in overlapping area. Hindwing trapezoidal. Upperside light grayish brown, cilia concolorous with wing. Underside light grayish brown.

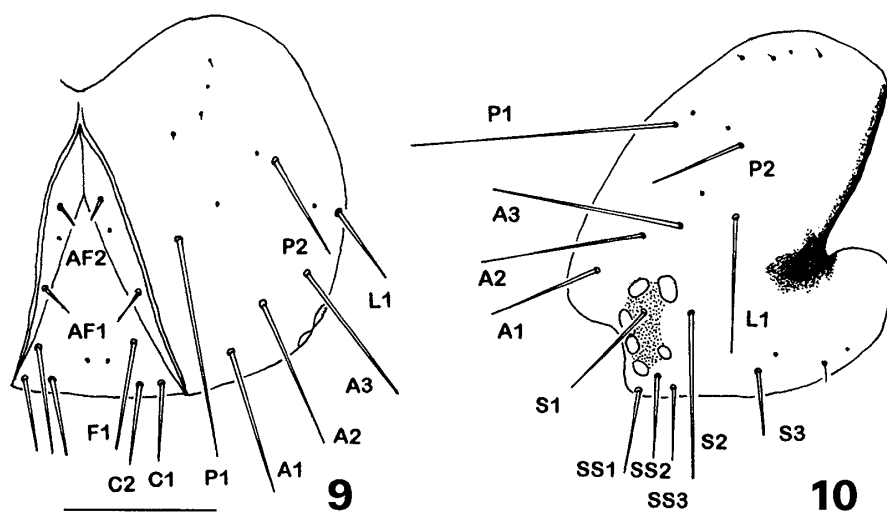
Male scent organ. Costal fold absent. Forewing on upper side with an ovate depression on basal 1/5 (base of discal cell). The depression is filled with whitish yellow, filiform scales and covered with large, domed, whitish scales.

Male genitalia (Fig. 6). Tegumen with a wide dorsal concavity. Uncus absent. Socius large, triangular, setose on inner side, with over ten stout setae on the apex. Gnathos weakly sclerotized. Aedeagus cone-shaped, armed with about eight fusiform cornuti. Valva slender, deeply constricted; sacculus with many long setae on the inner side; basal opening with a setose process on the posterior edge. Cucullus triangular, with many stout setae on the inner side; the posterior edge with five or six spine-like setae, tips slightly curved.

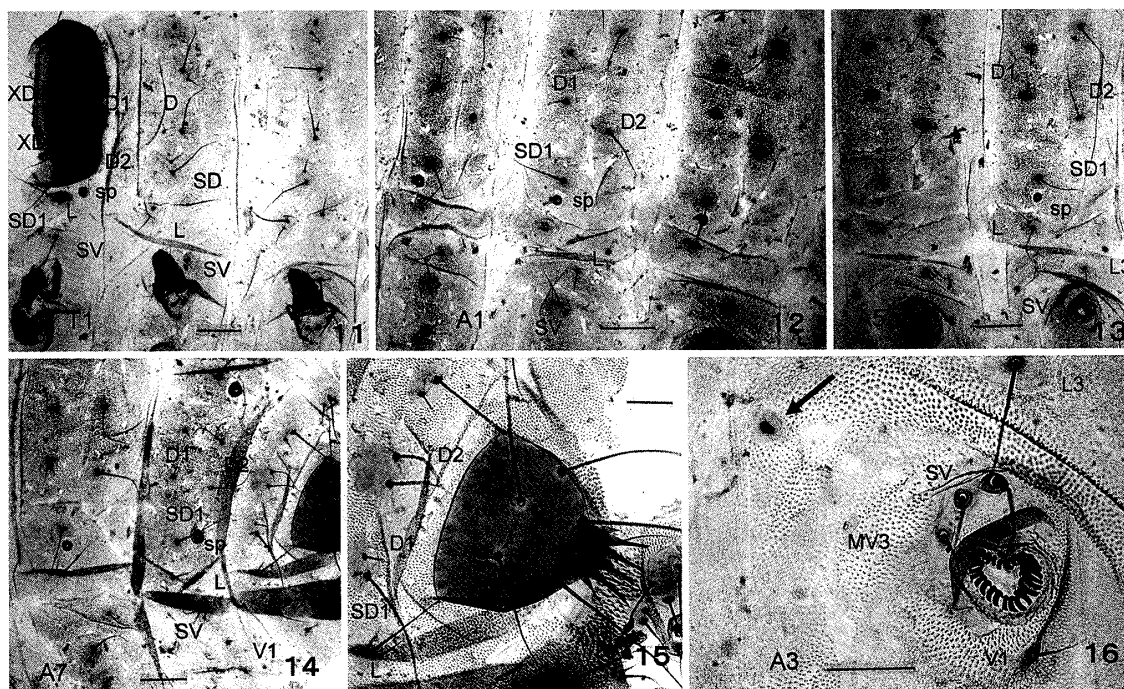
Female. Wing expanse 8–10 mm. Head and thorax similar to male, but antenna slender. Forewing color and wing pattern as in male, but costal base of forewing not concave.

Female genitalia (Fig. 7). Papillae anales large, flat. Apophyses posteriores as long as apophyses anteriores. Eighth sternite membranous, spinulose. Ostium bursae cup-shaped, located in an incision on posterior edge of seventh sternite. Ductus bursae sclerotized except anterior 1/6, twisted and curved at anterior 1/3. Seventh sternite trapezoid. Corpus bursae pear-shaped; signa two blade-like sclerites.

Mature larva (Figs 4, 9–16). Length 11–13 mm. Head somewhat shorter than broad, brown; stemmatal area brown; galea dark brown (Fig. 10); spinneret short, tapering distally. Prothoracic shield brown. Thoracic leg brown, with two enlarged pretarsal setae (blade-like). Body yellowish brown (Fig. 4); integument spinulose (Fig. 16). Crochets on ventral prolegs in a uniordinal circle, 22–26; crochets on anal proleg in a semicircle, 13–14. Small



Figs 9, 10. Head of *Heleanna turpinivora*, sp. nov. 9. Frontal aspect. 10. Lateral aspect. Sclae lines: 0.2 mm.



Figs 11–16. Larval chaetotaxy of *Heleanna turpinivora* sp. nov. 11. Thorax. 12. Abdominal segments 1–3. 13. Abdominal segments 5–6. 14. Abdominal segments 7–9. 15. Abdominal segment 9 and anal plate. 16. Abdominal segment 3, ventral, arrow: small circular plate. Scale lines of Figs 11–14: 0.2 mm; Figs 15, 16: 0.1 mm.

circular plate present in antero-dorsad area of ventral proleg on abdominal segments 3–6 (Fig. 16: arrow). Setae pale. Pinacula small, concolorous with body. Anal plate brown (Fig. 15). Anal fork present, six forked (Fig. 15).

Chaetotaxy (Figs 9–16). On head, P1 closer to AF1 than to AF2, A2 closer to A3 than to A1. On abdominal segments 1–7, SD1 and SD2 antero-dorsad to spiracle, on different pinacula; L group trisetose, L1 and L2 on a common pinaculum. On abdominal segment 9,

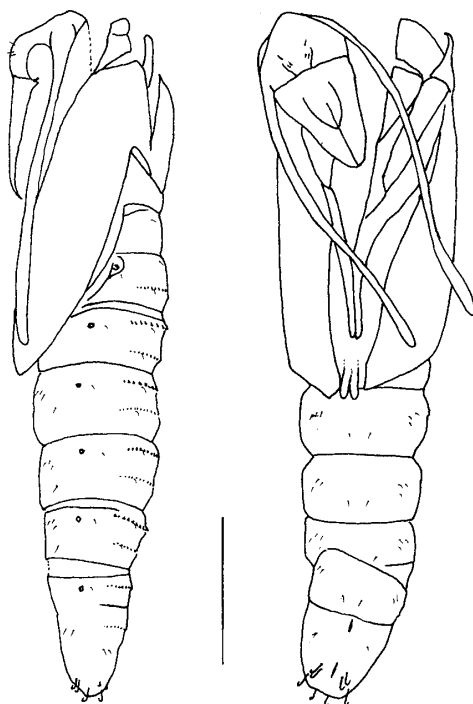


Fig. 17. Pupa of *Heleanna turpinivora* sp. nov. Scale line: 1 mm.

D2s on a common pinaculum; D1 and SD1 on a common pinaculum; L group trisetose on a common pinaculum. SV group on abdominal segments 1, 2, 3, 7, 8 and 9 consisting of 3, 3, 3, 2, 2 and 2 setae, respectively.

Pupa (Fig. 17). Length about 5 mm. Color pale brown. Clypeus with three pairs of setae. Maxillae shorter than prothoracic legs. Antennae about as long as mesothoracic legs. Mesothoracic legs shorter than forewings. Distal ends of metathoracic legs exposed. Forewings extending before middle of abdominal segment 4. Proleg scars undiscernible. Abdominal segment 10 with two pairs of hooked setae along anus and two pairs of hooked setae on the terminal edge.

Material examined. Adult. Holotype. ♂, emerged 21. v. 2000, Yona, Kunigami-son, Okinawa-jima Island, Ryukyu, JAPAN (Y. Nasu leg.), *ex Turpinia ternata*, genitalia slide no. YN988, UOP. Paratypes. JAPAN: Ryukyu: Okinawa-jima Island, Kunigami-son, Yona, 3 ♀, emerged 21. v. 2000 (Y. Nasu leg.), YNC; Ishigaki-jima Island, Banna Park, 1 ♂ 8 ♀, emerged 17. iv–2. v. 2001 (Y. Nasu leg.), YNC; Iriomote-jima Island, Haimi, 1 ♂ 3 ♀, emerged 20–23. iv. 2001 (Y. Nasu leg.), YNC. These paratypes were reared from larvae feeding on *T. ternata*. KOREA: Jeju-do Island, Andok valley, 1 ♂, 28. iv. 1994 (B. K. Byun leg.), KNA. Larva. Same locality as holotype, 2 exs, fixed on 14. v. 2000 (Y. Nasu leg.), *ex T. ternata*, YNC. Pupa. Same locality as holotype, 1 ♂ 1 ♀, fixed on 14. v. 2000 (Y. Nasu leg.), YNC.

Host-plant. Staphyleaceae: *Turpinia ternata* Nakai. Host-plant in Korea unknown.

Biological note. The larvae bore into the peduncles of *Turpinia ternata*, and sometimes fold the leaf edges or spin the flower buds in Okinawa. The damaged peduncles droop, and die (Fig. 3). Under laboratory conditions, fully-grown larvae vacated the larval habitats and spun tissues on the bottom of the rearing case or on the flower buds, constructing cocoons. Pupation took place in the cocoons. The resting posture of the adult is flat (Fig. 2).

Distribution. Japan (Okinawa), Korea (Jeju-do Island).

Etymology. The specific name is derived from the generic name of the host-plant.

***Heleanna tokyoensis* Nasu, sp. nov.** (Figs 5, 8)

Heleanna sp.: Owada *et al.*, 2000: 134.

Diagnosis. The species has a grayish yellow forewing with a large dark brown semicircular patch on the middle of the costa and two dark brown patches in apical 1/3 of the wing. The male genitalia are characterized by a wide dorsal concavity on the tegumen and a large oval cucullus. The moth is superficially similar to the preceding species, but the distinguishable characters are noted in the diagnosis for the preceding species.

Adult. Male (Fig. 5). Wing expanse 11 mm. Head yellow brown, tips of scales whitish; face flattened, with scales extending over it. Antenna simple, grayish brown. Labial palpus short, dark brown, brownish yellow on inner side; second segment triangular. Thorax and tegula dark brown, tips of scales whitish. Forewing elongate oblong, apex and tornus round. Upperside ground color yellowish gray, overlaid with dark brown and brown. Costa with a dark brown patch at the base and a semicircular dark brown patch at the middle. Two irregular dark brown patches on apical 1/3 of the wing, one slender one at the apical end of the discal cell and the other subapically. Apex dark brown. Two or three small gray patches along termen. Cilia dark brown, yellowish on tornus. Underside grayish brown, costa dark brown for basal 1/5, lighter in overlapping area. Hindwing trapezoidal. Upperside light grayish brown, cilia concolorous with wing. Underside light grayish brown.

Male scent organ. Costal fold absent. Forewing on upper side with an ovate depression on basal 1/5 (base of discal cell). The depression is small, and covered with large, domed, whitish scales.

Male genitalia (Fig. 8). Tegumen with a wide dorsal concavity. Uncus absent. Socius large, triangular, setose on inner side, with over ten stout setae in the apex. Gnathos weakly sclerotized. Aedeagus cone-shaped, armed with four fusiform cornuti. Valva constricted deeply; sacculus with many long setae on the inner side; basal opening with a setose process on the posterior edge. Cucullus oval, large, with many stout setae on the inner side; posterior edge with over ten spine-like setae, tips slightly curved.

Female. Unknown.

Material examined. Holotype. ♂, 18. iv. 1997, Garden of the Imperial Palace, Tokyo, JAPAN (Y. Arita leg.), genitalia slide no. NSMT2703, NSMT.

Host-plant. Unknown.

Distribution. Japan (Honshu).

Etymology. The specific name is derived from the type locality, Tokyo.

Discussion

The genus *Heleanna* is distributed in the Oriental and Australian regions, and five species including an undescribed one have been recorded to date (Clarke, 1976; Horak *et al.*, 1996; Nasu, 1995, 1999; Brown, 2005; Horak, 2006). As the two new species are described from Honshu of Japan and from Korea in the present study, the genus is recorded from the Palaearctic region for the first time. The host-plants and feeding habits of the five species are as follows. These larvae feed on several plants of various families and are stem- or fruit-borers, sometimes leaf rollers: *H. physalodes* (Meyrick, 1910) feeds on the flower buds

of *Barringtonia* (Lecythidaceae), the fruit of *Cordia* (Boraginaceae), and *Calophyllum inophyllum* (Guttiferae) (Clarke, 1976); *H. melanomochla* (Meryck, 1936) folds the leaf of *Mangifera indica* L. (Anacardiaceae) (Nasu, 1995); *H. fukugi* Nasu, 1999 bores into the buds or spins the young leaves of *Garcinia subelliptica* Merr. (Guttiferae) (Nasu, 1999); *H. sp.* feeds on *Pimelodendron amboinicum* (Euphorbiaceae) (Horak, 2006); *H. turpinivora* bores into the peduncle of *Turpinia ternata* (Stapyleaceae), sometimes folding the leaf or spinning the flower buds.

Detailed information has been given on the immature stages of the three species, *H. melanomochla* (Nasu, 1995), *H. fukugi* (Nasu, 1999) and *H. turpinivora*. The larvae and pupae of the three species have several common characters. The larva has the same chaetotaxy: on abdominal segment 9, D2s on a common pinaculum, D1 and SD1 on a common pinaculum and L group trisetose on a common pinaculum; SV group on abdominal segments 1, 2, 3, 7, 8 and 9 consisting of 3, 3, 3, 2, 2 and 2 setae, respectively. The thoracic leg of the larva has a pair of enlarged, blade-like pretarsal setae. Similar setae are also found in several species of Tortricidae (Nasu and Tominaga, 2005). Nasu *et al.* (2004) suggested the possibility that these enlarged setae are characteristic of larvae that bore into fruits or stems and mine leaves because similar setae are observed in various families, *e. g.* Incurvariidae, Lyonetiidae, Palaephatidae, Elachistidae, Cosmopterigidae, Peleopodidae, Heliodinidae, and Copromorphidae, and most of these larvae are known as stem- or fruit-borers or leaf miners. However, the function of the setae is unknown and many exceptions are present within the Tortricidae (Nasu and Tominaga, 2005). Further research is necessary to show the function of the setae. A small circular plate is present antero-dorsad from the ventral proleg on abdominal segments 3–6 of the larva. The function of the plate is unknown, but the structure is widely distributed in the Tortricidae (Komai, 1999; Nasu and Tominaga, 2005; Nasu *et al.*, 2005). The pupa has three pairs of setae on the clypeus and four pairs of hooked setae on abdominal segment 10. The shared possession of these characters is considered to support the monophyly of *Heleanna* though the characters are not peculiar to the genus.

Acknowledgments

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Owada, M., Arita, Y., Kishida, Y., Ikeda, M. and U. Jinbo, 2000. Moths of the Garden of the Imperial Palace, Tokyo, Central Japan. *Mem. natn. Sci. Mus., Tokyo* (36): 115–168.

摘 要

Heleanna 属 (鱗翅目, ハマキガ科, ヒメハマキガ亜科) の旧北区からの初記録および日本と韓国産 2 新種の記載 (那須義次・Bong-Kyu Byun)

Heleanna 属は、東洋区とオーストラリア区に分布する小さな属で、今まで 1 未記載種を含む 5 種が知られていた。本属は、今までに日本からは *H. fukugi* Nasu フクギモグリヒメハマキ 1 種のみが琉球列島から記録されており、韓国からは未記録であった。日本と韓国から採集されたヒメハマキガ標本を検討した結果、本属の 2 未記載種を認めたので本論文において新種として記載した。この結果、本属の種は 7 種となり、旧北区 (日本の本州および韓国済州島) から初めて記録された。本属の成虫は、外部表徴においてお互いに類似し、種を識別するためには交尾器の形態比較が有効である。7 種のうち、幼生期の形態が判明しているのは 3 種であり、いくつかの同じ形質を持つ: 幼虫は同じ刺毛配列を、胸脚は 1 対の刃状 pretarsal setae を、腹部 3–6 節は腹脚の前背方に小さな円形のプレートを持つ; 蛹の clypeus は 3 対の刺毛を、腹部 10 節は 4 対の鉤刺毛を持つ。これら形質は本属に特有のものではないが、これらの共有は本属の単系統性を支持するものと考えられる。

Heleanna turpinivora Nasu and Byun, sp. nov. ショウベンノキヒメハマキ (新称)

本種の前翅は黄褐色で、前縁中央部に大きな半円形の暗褐色斑、前翅の翅頂 1/3 と翅頂前に 2 暗褐色斑を有する。♂交尾器は、頂部が大きく凹んだ tegumen を、大きな三角形の socius を、細長い valva および 3 角形の cucullus を持つ。♀交尾器は、大きく扁平な papillae anales を、途中でねじれ折れ曲がった ductus bursae と洋なし型の corpus bursae を持つ。本種は次種に類似するが、前翅の地色は褐色味が強いこと、翅頂 1/3 の暗褐色斑が大きいこと、♂交尾器は小さな三角形の cucullus を持つことで識別できる。

寄主植物: *Turpinia ternata* Nakai ショウベンノキ (ミツバウツギ科)。

生態: 幼虫はショウベンノキの花柄に潜り、内部を摂食する; 時に葉縁を折りたたんだり、花蕾を綴ったりする。幼虫が潜った花柄は垂れ下がり、枯死する。

分布: 日本 (沖縄), 韓国 (済州島)。

Heleanna tokyoensis Nasu, sp. nov. ウズミクロモンヒメハマキ (新称)

東京の皇居で採集された 1 ♀に基づいて記載した。

本種の前翅は黄灰色で、前縁中央部に大きな半円形の暗褐色斑、前翅の翅頂 1/3 と翅頂前に 2 暗褐色斑を有し、前者の斑紋はより細い。♂交尾器は、頂部が大きく凹んだ tegumen を、大きな三角形の socius を、細長い valva および大きな卵形の cucullus を持つ。本種は前種に類似するが、識別点は前種の項を参照のこと。

♀および寄主植物は未知。

分布: 日本 (本州)。

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